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**NOTIFICATION OF THE RECORDING  
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From the INTERNATIONAL BUREAU

To:

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Date of mailing (day/month/year) 25 August 1999 (25.08.99)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference RSJ05738WO	
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1. The following indications appeared on record concerning: <input checked="" type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address TWO WAY TV LTD. The Chiswick Centre 414 Chiswick High Road London W4 5TW United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address TWO WAY TV LTD. Beaumont House Kensington Village Avonmore Road London W14 8TS United Kingdom	State of Nationality GB	State of Residence GB
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3. Further observations, if necessary:		
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## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

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Applicant

HOLMES, Steven et al

1. The designated Office is hereby notified of its election made:



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in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

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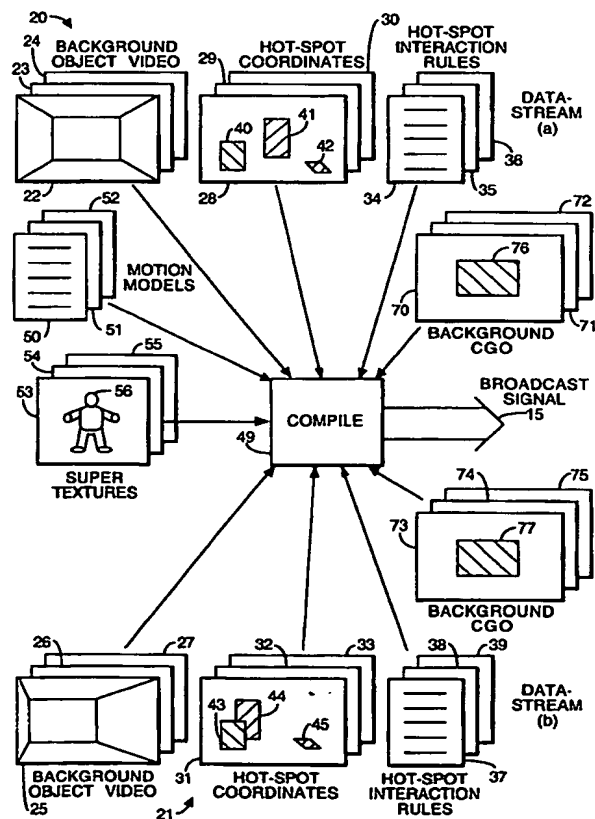
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## (57) Abstract

Apparatus for interactively generating a display signal. The apparatus comprises: a receiver (2) for receiving a broadcast signal (15), the broadcast signal comprising a plurality of datastreams each including image data defining a background object (22-270), and control parameters (28-39); a foreground computer generated imagery (CGI) device (3) for generating a foreground computer generated object (CGO); a mixer (4) for combining the foreground CGO with background object image data to generate the display signal; and interaction means (3) for receiving the control parameters from the receiver, monitoring the position of the foreground CGO, and adapting the display signal with reference to the monitored position of the foreground CGO and the received control parameters.



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METHOD AND APPARATUS FOR  
GENERATING A DISPLAY SIGNAL

This invention relates to a method and apparatus for interactively generating a display signal.

5       Traditional TV broadcast is characterised by temporal synchronisation for all viewers, ignoring the small differences in transit times of the signal due to differences in transmitter to user distances. Therefore at the moment of broadcast all viewers receive the same,  
10       uniform signal substantially instantaneously. Interactive forms of the medium, such as Two Way TV, Web TV are generally characterised by providing the viewer with the facility to interact with a designated interactive area of the TV screen. This may utilise a split screen in which  
15       the interactive area may have internet information, an on screen menu, or information which may be relevant to the main broadcast part of the TV screen. These systems are characterised by presenting information in response to the user's interaction within a fixed predefined interactive  
20       area of the screen.

      In contrast to the limited interaction with TV broadcast on current systems, computer games consoles (eg. Sony Playstation, Sega Saturn, Nintendo 64) are presented to the viewer on TV screens or dedicated display screens,  
25       but each viewer has the ability to achieve unique interaction with the imagery/sounds presented on the TV, which are processed by the games console using computer technology, in response to the users actions. Generally the user's perceived TV environment (including images,  
30       sounds and other sensory signals) are produced by computer generation within the games console, which may or may not also utilise digitised predefined data, such as sounds in the TV environment which shall be referred to as the computer generated environment (CGE) or in the specific  
35       case of images, computer generated imagery (CGI). These games consoles and the CGE are characterised by high frequency update rate, typically in excess of 25 frames per

second or 25Hz. This gives the impression of instantaneous or real time response to the user's actions and also a smooth and seamless dynamic image. The individual frames are not discernible as individual frames, but rather  
5 contribute to the overall real time dynamic environment, giving the impression of real time control and interaction with the CGE.

It is desirable that the real time CGE is as realistic as possible, and greater degrees of realism are generally  
10 achieved by increased computer processing power and by using the most efficient representation in terms of realism versus processing power. By way of example only, one of the most efficient representations for CGI uses relatively coarse polygonal or faceted geometric model in which the  
15 greatest detail in terms of polygon distribution would generally be used in the more geometrically complex areas. By a process known as texture mapping, in which photorealistic textures representing surface features are mapped onto the individual polygon faces, a relatively  
20 realistic CGI is achieved notwithstanding the relatively coarse polygonal geometry representation. The product of the number of texture mapped polygons in the CGI and the image update rate measured in frames per second yields a number defining the number of texture mapped polygons the  
25 computer processing is required to process per second, which may be 1,000,000 polygons per second.

We have identified that the level of interaction offered to the viewers of interactive broadcast TV is limited, and this consequently limits the applications of  
30 such medium. Furthermore we have identified that although the interaction of a games console is greater than interactive TV, the actual theme of the CGE is limited to the specific game content loaded into the console, for example via CD ROM, cartridge, the internet or broadcast to  
35 a TV with the appropriate hardware to run CGE type games or by other means.

In accordance with a first aspect of the present invention there is provided apparatus for interactively generating a display signal, the apparatus comprising

a receiver for receiving a broadcast signal, the broadcast signal comprising a plurality of datastreams each including image data defining a background object, and control parameters;

a foreground computer generated imagery (CGI) device for generating a foreground computer generated object (CGO);

a mixer for combining the foreground CGO with background object image data from the receiver to generate the display signal; and

interaction means for receiving the control parameters from the receiver, monitoring the position of the foreground CGO, and adapting the display signal with reference to the monitored position of the foreground CGO and the received control parameters.

In accordance with a second aspect of the present invention there is provided a method of interactively generating a display signal, the method comprising

receiving a broadcast signal, the broadcast signal comprising a plurality of datastreams each including image data defining a background object, and control parameters; generating a foreground computer generated object (CGO);

combining the foreground CGO with the background object image data to generate the display signal;

monitoring the position of the foreground CGO; and adapting the display signal with reference to the monitored position of the foreground CGO and the received control parameters.

The present invention provides the capability of interaction with the actual broadcast itself as it appears on a screen in real time.

Typically the method and apparatus is provided for use in association with a TV set to provide levels of

interaction with broadcast content that is normally associated with a games console, whereby such interaction is achieved within the main broadcast as presented on their TV screen. This provides the user or viewer with a CGE, hereinafter referred to as the foreground computer generated object (foreground CGO) which interacts with the broadcast signal which by way of example only may be delivered by Digital Terrestrial, Satellite or Cable broadcast medium and in which the background object typically changes continuously during the broadcast transmission, not only from programme to programme but from frame to frame at a rate of, by way of example only, in excess of 20Hz.

Advantageously this invention offers full screen interaction via the foreground CGO with objects represented in the broadcast, for example but not exclusively visible objects, and such interaction is assured even though objects may change position, shape, motion, behaviour at the broadcast update rate, and furthermore the nature of the interaction with such objects may also change at the broadcast rate.

The term "broadcast" as used herein is intended to cover all transmission media, including but not exclusively, digital terrestrial, cable, satellite broadcast to all display devices, including but not exclusively, TV, computer, or games console. The broadcast is typically a mass broadcast (ie. the signal is broadcast simultaneously to a plurality of TVs, computers or game consoles). The signal may also be broadcast via the Internet. The term "datastream" as used herein refers to different broadcast content relating to the same programme, and all datastreams are broadcast substantially simultaneously. The term "programme" refers to a set of such multiple datastreams which relate to the same programme, where each datastream within the set of datastreams making up the programme broadcast are temporally synchronised, and relate to the same content but, by way of example only, offer an alternative view of



the content. The term "CGE" as used herein is intended to cover a multimedia representation, including but not exclusively still images, dynamic images, sounds, real time images and real time audio signals. The term "foreground CGO", "foreground CGE" or "foreground" as used herein is intended to relate to any and all representations which are not part of the broadcast, but are computer generated and which may be displayed on the TV screen, by way of example but not exclusively overlaid on the broadcast or in a separate interactive area of the screen. Alternatively the "foreground CGO" "foreground CGE" or "foreground" may apply to such representations which are not part of the broadcast and are not displayed or otherwise represented on the TV screen. By way of example only, portions or sections of the foreground CGO may be hidden from the user or viewer for the purpose of acting as geometric reference to calculate interaction between the foreground CGO and the background object. The term "computer" in the context of "computer generated", "computer processing", "computer generated imagery" or "computer generated environment" refers to any apparatus, equipment, hardware, software, parts thereof and combinations thereof which processes the foreground CGE, and by way of example only may be a computer, a set top box (as produced by General Instruments, Pace Micro Technology by way of example only), a games console (as produced by Sony, Sega, Nintendo by way of example only), parts or sections thereof, or customised hardware including but not exclusively computer memory, a processor and an optional graphics processor. The term "TV screen" or "display screen" as used herein is intended to cover any display device or system or assembly in which there is a display element including but not exclusively, TV screen, computer monitor, projection system, head mounted display. The term "receiving hardware" as used herein refers to any apparatus, equipment, hardware, software, parts thereof and combinations thereof which receives the broadcast datastreams, the receiving hardware

input from the broadcast medium and transmits the signals, the receiving hardware output to the mixer, and may by way of example only be referred to as a decoder, and by way of example only may be a computer, a set top box (as produced by General Instruments, Pace Micro Technology by way of example only), a games console (as produced by Sony, Sega, Nintendo by way of example only), parts or sections thereof, or a customised hardware including computer memory, a processor and an optional graphics processor.

10 The term "nominal user position" or "user position" defines a distance measured normal from the plane of the TV screen in a normal direction, to the position of the user, where this distance and the user position are used purely for calculation purposes, and impose no further restriction on the actual user position in addition to the everyday physical constraints. The terms "viewer", "viewers", "user" and "users" can be exchanged and interchanged with no loss of generality. The term "controller" or "hand controller" as used herein refers to any device with which

20 the foreground CGO and interaction with the background CGO is controlled by the user, including but not exclusively motion and interaction, requests to upload and download other data or information. By way of example only, the controller may be an infrared device operated by buttons or

25 direct voice activation.

Advantageously, with the broadcast signal, there are multiple datastreams relating to the programme, each datastream representing, by way of example only, an alternative view, a user selectable view, additional

30 relevant information pertinent to the corresponding frame on one or more of the other datastreams, where each datastream is updated at, by way of example only, 25Hz. The multiple datastreams may be time-division-multiplexed, ie. transmitted one after the other on a single frequency.

35 Alternatively the datastreams may frequency-division-multiplexed, ie. transmitted simultaneously on different frequencies.

Advantageously, within the broadcast signal, control parameters are transmitted on each datastream, and temporally synchronised with each frame of the datastream broadcast, which may by way of example only be transmitted at a rate of 25 frames per second, and such control parameters define the interaction the user can achieve between the foreground CGO and the background CGO or the broadcast for each frame, and those control parameters and the associated defined interaction may vary at a rate of eg 25Hz. The control parameters are used by the interaction means to define the interaction for that particular frame of the datastream broadcast.

Typically the broadcast signal contains multiple datastreams relating to the same programme, and temporally synchronised control parameters. The broadcast is received by the receiving hardware, which by way of example only may be a set top box or part thereof. The receiving hardware transmits the decoded broadcast images to the mixer at a predetermined rate (eg 25Hz).

Advantageously, the control parameters are concurrently or simultaneously received by the interaction means, and for each frame of the broadcast signal the areas of interaction and the nature of such interaction is stored for each frame. By way of example, the areas of interaction are defined by the co-ordinates in three orthogonal axes resolved or projected into the substantially 2 dimensional plane of the TV screen with a predefined viewing angle, resulting in a 2 dimensional representation of the interaction areas overlaid on each frame of the broadcast and such frames and the associated interactive areas may change at the update rate, eg 25Hz. For example the viewing angle may be 90° in a horizontal plane, which in turn defines a nominal user position for computer calculations and projection from the three dimensional representation to the two dimensional screen representation. The viewing angle and the corresponding nominal user position define the extent of the broadcast

background visible on the screen, and are preferably selected to complement and match broadcast standards for visible viewing angle.

Advantageously the nature of the interaction for each  
5 area may include, but not exclusively, areas within the background that the user controlled foreground CGO can interact with, areas which the user can click with a cursor device, areas which are linked to information sources activated by clicking, the type of interaction between the  
10 foreground CGO and the interactive area.

Advantageously, the processing within the foreground CGI device generates the foreground CGO, which is the user controlled representation by which the user interacts with the interactive areas defined by the control parameters for  
15 each frame. The foreground CGI device transmits the foreground CGO to the mixer to be overlaid on the background object within the broadcast signal for each frame of the broadcast (eg at a rate of 25 Hz), whereby the position, shape and other features of the foreground CGO  
20 including but not exclusively colour, sound, direction of motion, visibility, as modified by the user interaction, are updated at the aforementioned rate.

Preferably the mixer combines the representations of the background broadcast and the foreground CGO such that  
25 the foreground CGO is overlaid on the background broadcast and the background CGO.

Advantageously there is processing available to determine which individual pixels within the foreground CGO, the background broadcast and any other displayed  
30 feature are closer to the plane of the TV screen when measured in the aforementioned three orthogonal axes defining a three dimensional geometric space. Furthermore, for each pixel position of the screen measured in the two dimensional screen co-ordinates, the pixel properties  
35 including but not exclusively colour, are those representing the properties of the object closest to the screen measured in the aforementioned 3 orthogonal axes at

the point projected onto the two dimensions of the TV screen. Advantageously geometric information relating to the background is conveyed in the control parameters defining the background CGO. Advantageously, parts or  
5 sections of objects including but not exclusively the foreground CGO, the background CGO and the broadcast background which when resolved into the screen co-ordinate system lie outside the screen dimensions or lie between the screen and the nominal user position, or are within the  
10 screen dimensions but further away from the screen than some other object are not displayed. This process is conventionally known as culling.

Advantageously for material recorded in any format for subsequent broadcast, including but not exclusively Betacam  
15 or digitally stored images, the control parameters are encoded in or with the material prior to broadcast. The control parameters for each frame of the broadcast may include the areas of interaction defined in the two dimensional screen co-ordinates, the nature of the  
20 allowable interaction, the resulting action arising from such interaction. By way of example only, interaction with one of the areas may cause information to be displayed, or an alternative datastream of the broadcast to be displayed, or further information be displayed on the screen.

Advantageously for live broadcast material or real  
25 time feeds, the control parameters are generated automatically or semi-automatically, eg utilising vision systems which interpret each frame of the broadcast as it occurs in order to identify particular features within the  
30 frame image, and within such group of features areas that are to be automatically converted to interactive areas. The conversion from vision system identified features to interactive areas may be augmented by the use of technology including but not limited to, artificial intelligence,  
35 neural networks, knowledge based systems or combinations thereof, to generate such interactive areas and other control parameters subject to predefined rules based on the

identification of the nature of the feature. Preferably, the rate at which the control parameters are generated is commensurate with live broadcasting, and by way of example only, this will be at a rate equivalent to the broadcast  
5 frame update rate (eg 25Hz). For the purpose of illustration only, this technique used with live broadcast may be used for computer games based on live footage or training simulators based on live geographic features and scenarios.

10 Advantageously, the type of foreground CGO may be selected by the user from a library of such foreground CGO stored in memory, or on a data storage device connected to the foreground CGI device which may be a DC ROM, or a Digital Versatile Disc (DVD). Preferably the foreground  
15 CGO may also be downloaded to the foreground CGI device at the beginning or during the broadcast of the control parameters. Such definition of the foreground CGO will define features including but not exclusively, colour, shape, texture, allowable movement, sound effects,  
20 articulation on screen.

Advantageously, the foreground CGO object movement and interaction is controlled via a user input using a hand controller (eg a standard or modified infrared controller) and subject to the rules defined by the control parameters  
25 for each frame. Alternatively other input devices may be used to control the foreground CGO and interaction including but not exclusively, voice activation, mouse, game controller or pad.

Advantageously, the nature of the foreground CGO will  
30 match the nature of the broadcast. By way of example only, a broadcast comprising a road or driving theme where the road representation itself is an interactive area may suit a foreground CGO based on a vehicle, such as a car. The car based foreground CGO will have motion dynamics  
35 representative of a real car, to the extent that a games console car is representative. By way of a further example, a broadcast comprising an exploration or tour

theme may suit a foreground CGO based on an articulated walking human figure, and the control parameters would define valid interactions, eg the ability to walk the foreground CGO through doors in the broadcast background, but not through walls.

Alternatively in some broadcast programmes or themes, the foreground CGO may not match the broadcast, and may be an abstract representation of the position of the foreground CGO, such as a cursor, an arrow, or an icon graphic of a hand.

When the user controls the foreground CGO with the controller, the foreground CGO may perform functions including translational motion and rotational motion about the three orthogonal axes and combinations thereof resolved into the two dimensional screen co-ordinates, initiate sounds, or interact with defined interactive areas where such interaction results in further action (eg information presentation in text, graphic, video or multi-media forms or combinations thereof).

Advantageously, the user has the option of downloading information from the broadcast, relevant to the broadcast, eg foreground CGO representations, additional information, software, control parameters.

Preferably the user will also have the option of uploading information relevant to the broadcast programme by specific interaction between the foreground CGO and the background CGO. Such uploading is typically achieved by communication between the controller and the interaction means. By way of further examples, certain types of uploaded request may be considered as an uploaded control parameter, which may cause a switch to a different datastream of the broadcast containing additional information, whereas other uploaded requests may be for information not available within the broadcast, and such requests are routed to a World Wide Web site for the specific programme via telephone connection and modem. Preferably the user will also have the option of uploading

data relevant to the programme, eg performance scores achieved by the user in an interactive game scenario.

By way of further explanation, it may be informative to consider the control parameters and the interactive areas defined by such parameters as a background CGO with which the user via the controller can cause the foreground CGO to interact with. Preferably, but not essentially, the background CGO includes a coarse geometric representation and visual quality is greatly improved by the aforementioned technique of texture mapping whereby the broadcast image for each frame is a substantially full screen texture which we will refer to a Supertexture. Preferably, the geometry of the background CGO is not visible to the user. By way of further clarification the combination of the foreground CGO, the interaction defined in the control parameters, the background CGO defined by the control parameters and the broadcast Supertexture provide an interactive CGE based on the broadcast technology which is comparable with that achieved with a games console.

The aforementioned combination of features provides the user with the ability to interact with the features within the broadcast.

Advantageously, this invention may be used as the basis or foundation of a commercial service in which the user pays for usage, eg on a per programme or per unit time basis. Advantageously, such payment method may be incorporated into the apparatus, such as smart card operation, or an additional feature of the interaction via the controller, such as a user capability to enter credit card information which is then treated as uploaded information as previously described, using secure transaction protocols and techniques.

An embodiment of the present invention will now be described with reference to the accompanying drawings, in which:



Figure 1 is a schematic diagram of an interactive system;

Figure 2 is a schematic diagram showing the compilation of the broadcast signal; and

5        Figures 3-8 show different images displayed on the screen.

Figure 1 shows a schematic of the apparatus and connectivity. The programme broadcast has an origin 1 and broadcasts multiple datastreams (a)-(d) in a mass broadcast  
10        signal 15 via a broadcast medium 7, which are received by receiver hardware 2 in a set top box 14. Only a single set top box 14 is shown but it will be appreciated that the mass broadcast signal 15 will be picked up by a large number of set top boxes at any one time.

15        Figure 2 is a schematic drawing illustrating how the origin 1 compiles the broadcast signal 15. In Figure 2 only two datastreams 20,21 (ie. datastream (a) and datastream (b)) are shown but in a practical system a large number of datastreams will be compiled and broadcast  
20        simultaneously, with the number of datastreams being limited only by the bandwidth of the broadcast medium 7.

Each datastream 20,21 comprises a series of frames of background object image data, and control parameters which control interactions with the background image data. The  
25        background object image data comprises a series of frames of live full screen broadcast video data (frames 22-27) and CGI image data 70-75 (referred to hereafter as background CGO). In this example frames 22-24 are three subsequent live TV frames of video data showing a room viewed from a  
30        central position, and frames 22-24 are views of the same room viewed from a position at one side of the room. The background CGO 70-75 contains a computer generated description of the back wall 76,77 of the room, along with its 3D positional coordinates. The background CGO 70-75  
35        may be simply in the form of bitmap data or it may be a CGI programme which can be loaded into the set top box to generate a CGI image.

In addition each datastream comprises a set of control parameters including hot-spot coordinates 28-33 and hot-spot interaction rules 34-39. The hot-spot coordinates 28-33 comprise three-dimensional position coordinates which  
5 define the positions of "hot-spots" 40-45 in the room as viewed from the respective viewing positions of datastream (a) and datastream (b). The hot-spot interaction rules 34-39 define the nature of the interaction between the foreground object and the hot-spots, as discussed below.

10 The origin 1 also generates software motion models 50-52 (which define the relationship between the user inputs and the movement of the foreground object, as discussed in further detail below) and foreground supertexture data 53-55. In addition the origin 1 generates frame identifiers  
15 48 which are transmitted with each respective frame of information. For instance items 22,28,34,25,31 and 37 are all associated with the same frame and hence are given the same frame identifier.

The datastreams are compiled by a compiler 49 to form  
20 the broadcast signal 15 as illustrated in Table 1. Table 1 illustrates an example in which ten datastreams are carried by the broadcast signal 15. The broadcast signal 15 comprises a series of time-division-multiplexed data packets which are transmitted in the order shown in Table  
25 1. The first two packets contain the supertexture data 53-55 and motion models 50-52. Packet 3 is a datastream identifier associated with datastream (a). Packet 4 is a frame identifier associated with the first frame. Packets 5-8 contain the data associated with the first frame of  
30 datastream (a) (ie. items 22,28, 34 and 70 from Figure 2). Packets 9-14 carry datastream (b) information for the first frame. Packets 15-62 (not shown) carry data associated with the eight other datastreams for the first frame  
(including packet 57 which is a datastream (j) identifier,  
35 and packet 58 which is a frame identifier associated with the first frame).

The next frame of information is then transmitted, starting with packet 63 (datastream (a) identifier) and packet 64 (frame 2 identifier).

5 Although the background object data and hot-spot data is shown in Table 1 being transmitted at the same rate, it will be appreciated that in other cases (e.g. with a stationary background) the data may be transmitted at different rates.

10 The non-video data 10 in the broadcast signal 15 (ie. the background CGO data 70-75, the hot-spot coordinates 30 and the hot-spot interaction rules 34-39) are passed to a computer 3, and an initial datastream is selected by an upload request signal 11 from the computer 3 to the receiver hardware 2. The background object video data 8  
15 (eg. frames 22-24) in the selected datastream is decoded and transmitted to a mixer 4. The computer 3 generates a foreground CGI image and a background CGI image (as defined by the programmes contained in the background CGO data 70-72) and the calculated CGI representation 16 is transmitted  
20 to the mixer 4. The foreground CGO, the background CGO, and the video data 8 are combined for every pixel on the TV screen 5 and the resulting combined signal 17 is transmitted to the TV screen 5. The multiple datastreams (a)-(d), the control parameters 10, the selected datastream  
25 8, the upload request signal 11, the foreground and background CGO 16 and the combined signal are updated at a rate of, by way of example only, 25 times per second. The foreground CGO and interaction with the background CGO is controlled by the controller 6. Control signals from the  
30 controller are transmitted 9 to the computer, which by way of example only, may modify the foreground CGO representation whilst the background CGO is updated based on the updated broadcast control parameters 10 and the recalculated representation 16 is transmitted to the mixer  
35 17. Uploaded information or requests for information not contained within the broadcast will be routed 12 to a World Wide Web site 13 for the specific programme via telephone

connection and modem 18. In the case where the invention is used as the basis of a commercial service, the receiver hardware 2 is activated only after valid user payment has been made via the smart card device 21, and the control  
5 activation signal 22 has been sent to the receiver hardware 2, thereby initiating the whole process.

Figure 4-7 are views of the TV screen 5 during an interactive game. At the start of the game, the origin 1 transmits the motion models 50-52 and supertexture data 53-  
10 55. The data 50-55 is passed to the computer 3 and stored. The user then selects a preferred character to play the game using controller 6. In this example the user selects a human character 56 associated with supertexture data 53 and motion model 50.

15 The datastreams are then transmitted as illustrated in Table 1. An example of a suitable data protocol is digital MPEG2. Initially the computer 11 automatically generates a default upload request signal 11 (ie. without any input from the controller 6) which causes the receiver 2 to  
20 select and decode the default datastream (a). As a result, the image on the screen 5 is as shown in Figure 3, ie. a background image 57 of a room as defined by the background object video data 22-24, with a back wall 78 generated from background CGO data 70-72, a hot-spot 41 (a door at the  
25 back of the room), a hot-spot 40 (a feature, eg a chair or table on the floor of the room) and a hot-spot 42 (a trap-door). The computer 3 generates a coarse CGI representation of character 56, with further definition being provided by the supertexture data 53. Additional  
30 supertexture or motion models may be provided by a CD ROM or other storage device 19. The CGI character 56 is transmitted to the mixer 4, and overlaid on the background view 57. By operating controller 6, the user can move the character 56 around the room as indicated by the arrows in  
35 Figure 3, with the range of movement being defined by the motion model 50 associated with the character 56.

When the user presses a "view change" button on controller 6, an upload request signal 11 causes the receiver 2 to switch the selected datastream 8 to datastream (b). The view on screen 5 then changes to the view 58 shown in Figure 4, as defined by the background video data 25-27 and background CGO 73-75.

An alternative method of switching datastreams is shown in Figures 5 and 6. When the character 56 reaches door 41, the computer 3 senses that the character 56 is coinciding with a hot-spot 41 (with reference to the hot-spot coordinates 28-30) and downloads the hot-spot interaction rule (34-36) associated with hot-spot 41. The downloaded rule states "if character reaches door 41, then cause background CJO image to open door, and then switch to datastream (j)". Therefore the computer 3 first generates a CGI image of the door 41 opening (under the control of the program downloaded from the broadcast GGO data (70-72)) and then generates an upload request signal 11 which causes the receiver 2 to switch to datastream (j) which contains a view 59 of a different room with hot-spots 60-62 (Figure 6).

The process of "culling" is illustrated in Figure 7. The computer 3 knows the three-dimensional position of the character 56 in the room 57, and also knows the position of the hot-spot 40 (as contained in the hot-spot coordinates 28-30). If the character 56 is "behind" the hot-spot 40 (as viewed from the current viewing position) then the computer 3 recalculates the representation 16 of the character 56 and does not transmit the obscured part of the character 56 to the mixer 4.

Figure 8 illustrates an alternative, two-dimensional game. A background scene 80 is formed by a single bitmap of background CGO data. A pair of foreground CGI characters 81,82 in a fighting game are superimposed on the background scene 80, and can be moved around the scene 80 by respective controllers. Three hot-spots 83-85 each display advertising material, and each has an associated

hot-spot interaction rule "characters should not pass in front of hot-spot and obscure advertising material". This prevents the computer 3 from causing the characters 81,82 to pass in front of the hot-spots 83-85. In the case of  
5 Figure 8, the background is static and so the background video data and/or background CGO is only transmitted once during a game, instead of once every frame (as with a moving background).

APPENDIX

TABLE 1

Packet No.	Packet Description
	1 character supertextures
5	2 character motion models
	3 datastream identifier
	4 frame 1 identifier
	5 background object video data
	6 background object CGO data
10	7 hot-spot area coordinates
	8 hot-spot interaction rules
	9 datastream (b) identifier
	10 frame 1 identifier
	11 background object video data
15	12 background object CGO data
	13 hot-spot area coordinates
	14 hot-spot interaction rules
	• •
	• •
20	• •
	57 datastream (j) identifier
	58 frame 1 identifier
	• •
	• •
25	• •
	63 datastream A identifier
	64 frame 2 identifier
	• •
	• •
30	• •

CLAIMS

1. Apparatus for interactively generating a display signal, the apparatus comprising

5 a receiver for receiving a broadcast signal, the broadcast signal comprising a plurality of datastreams each including image data defining a background object, and control parameters;

10 a foreground computer generated imagery (CGI) device for generating a foreground computer generated object (CGO);

a mixer for combining the foreground CGO with background object image data from the receiver to generate the display signal; and

15 interaction means for receiving the control parameters from the receiver, monitoring the position of the foreground CGO, and adapting the display signal with reference to the monitored position of the foreground CGO and the received control parameters.

20 2. Apparatus according to claim 1 wherein the control parameters define the position(s) of one or more areas of interaction in the background object, and wherein the interaction means adapts the display signal when the position of the foreground CGO coincides with the position of a selected area of interaction.

25 3. Apparatus according to claim 2 wherein the control parameters define one or more rules associated with the or each area of interaction, and wherein the interaction means adapts the display signal in accordance with the or each rule associated with the selected area of interaction.

30 4. Apparatus according to any of the preceding claims wherein the interaction means adapts the display signal by adapting the foreground CGO input to the mixer.

5. Apparatus according to any of the preceding claims wherein the broadcast signal comprises a plurality of  
35 datastreams, the receiver transmits background object image data to the mixer from a selected one of the datastreams, the selected one of the datastreams being selected in



response to an upload request signal, and wherein the apparatus further comprises means for inputting upload request signals to the receiver in response to input from a user.

5 6. Apparatus according to claim 5 wherein the interaction means adapts the display signal by inputting an upload request signal to the receiver.

7. Apparatus according to any of the preceding claims further comprising a user operable controller for  
10 controlling the foreground CGO generated by the foreground CGI device.

8. Apparatus according to any of the preceding claims wherein the control parameters define the three-dimensional position of a feature in the background object, and wherein  
15 the interaction means causes the foreground CGO to be at least partially obscured when the monitored position of the foreground CGO lies behind the three-dimensional position of the feature.

9. Apparatus according to any of the preceding claims wherein the image data defining a background object  
20 comprises video data.

10. A method of interactively generating a display signal, the method comprising

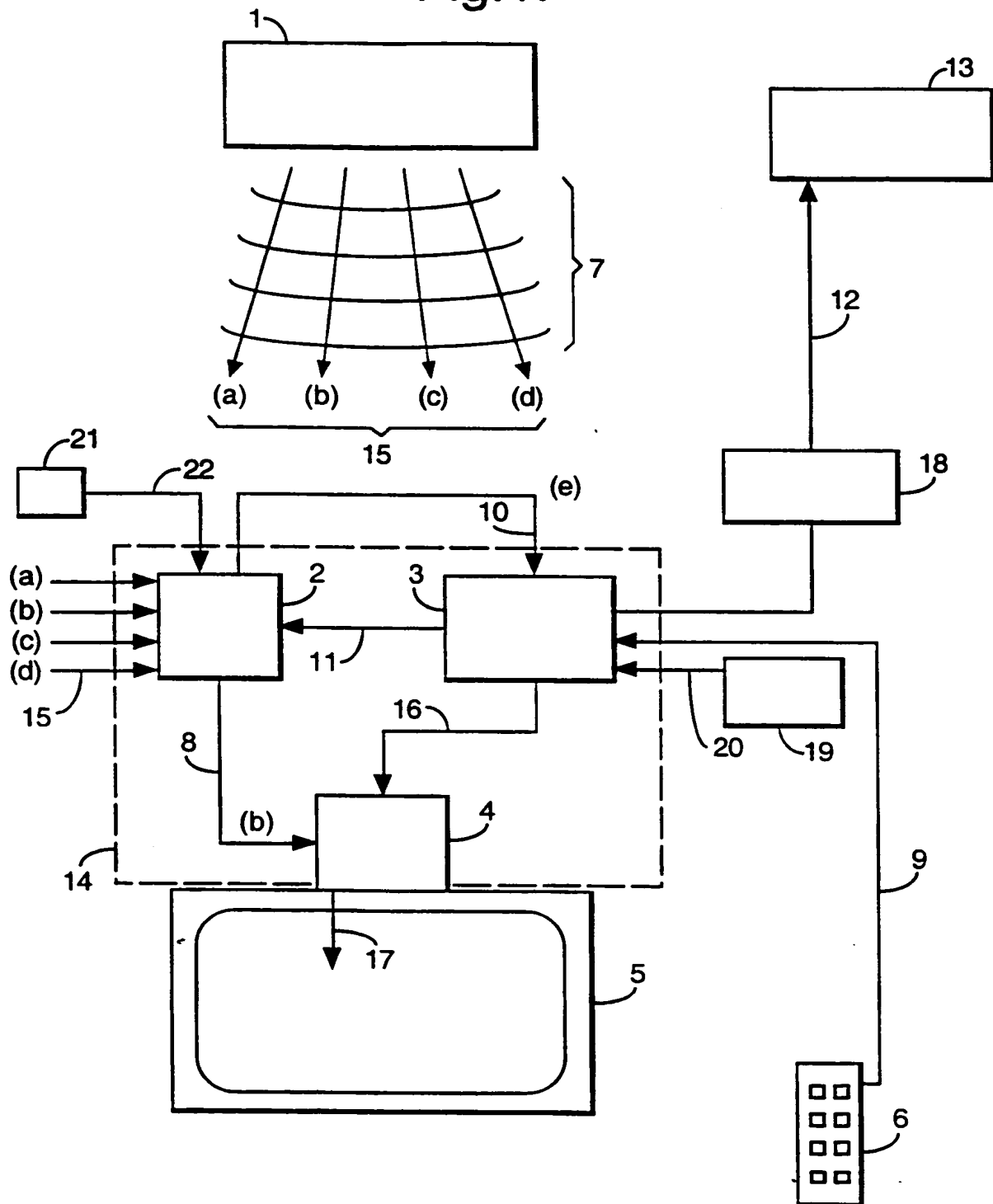
receiving a broadcast signal, the broadcast signal  
25 comprising a plurality of datastreams each including image data defining a background object, and control parameters;  
generating a foreground computer generated object (CGO);

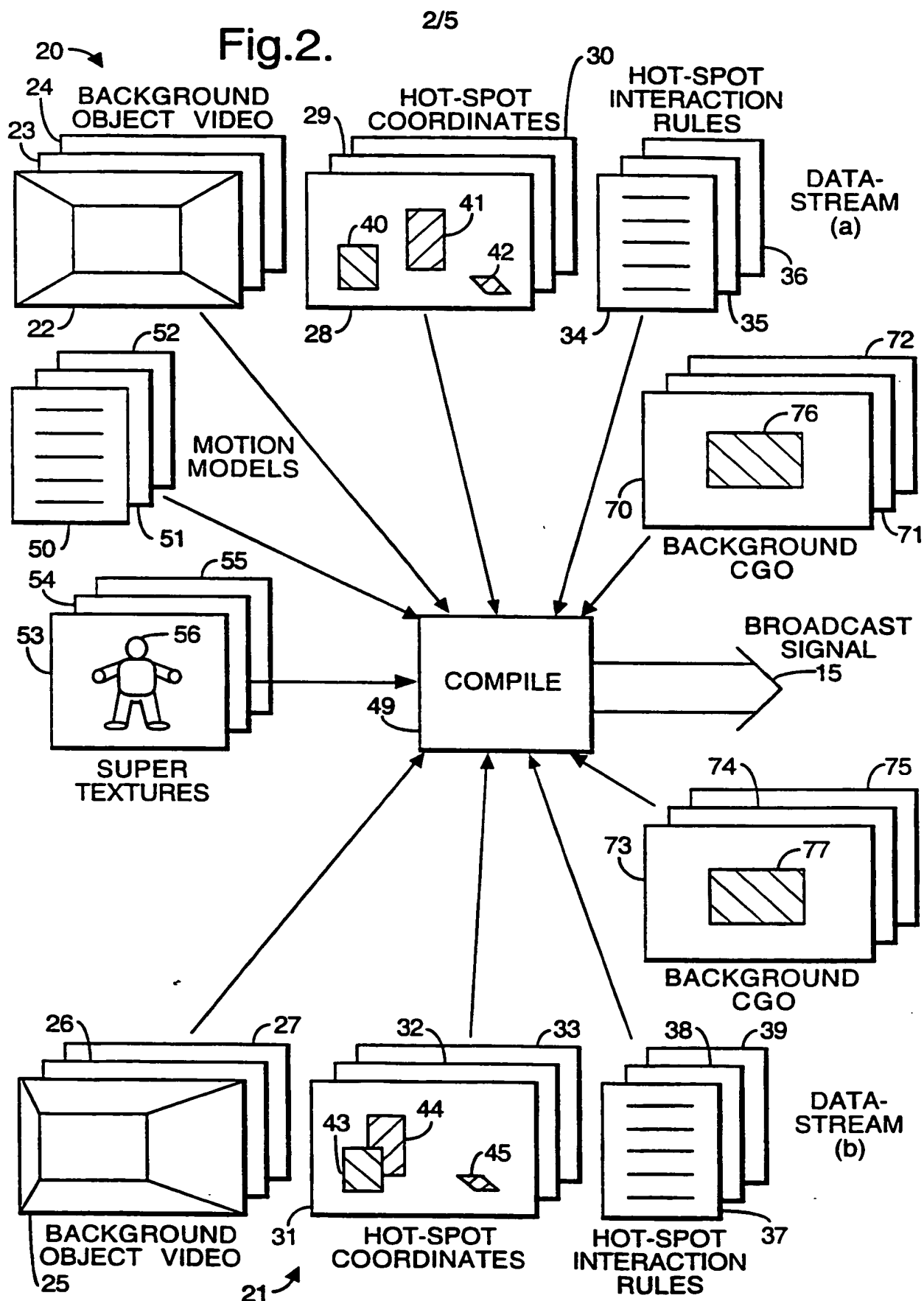
combining the foreground CGO with the background  
30 object image data to generate the display signal;

monitoring the position of the foreground CGO; and  
adapting the display signal with reference to the monitored position of the foreground CGO and the received control parameters.

1/5

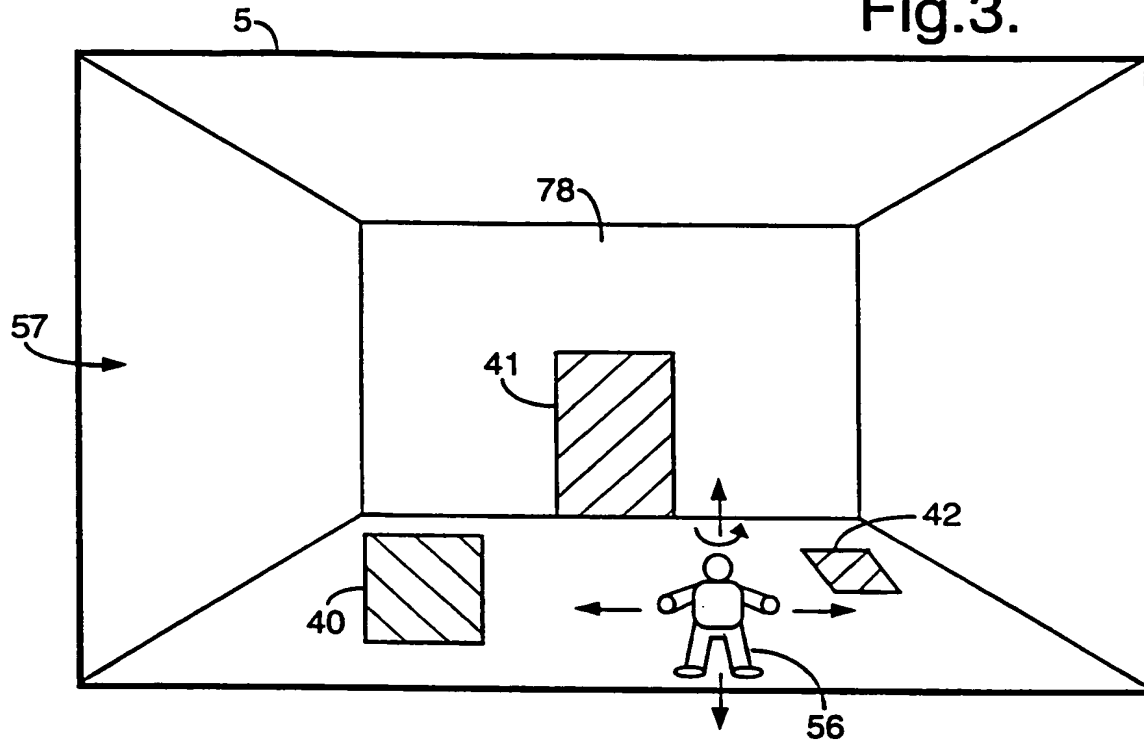
Fig. 1.





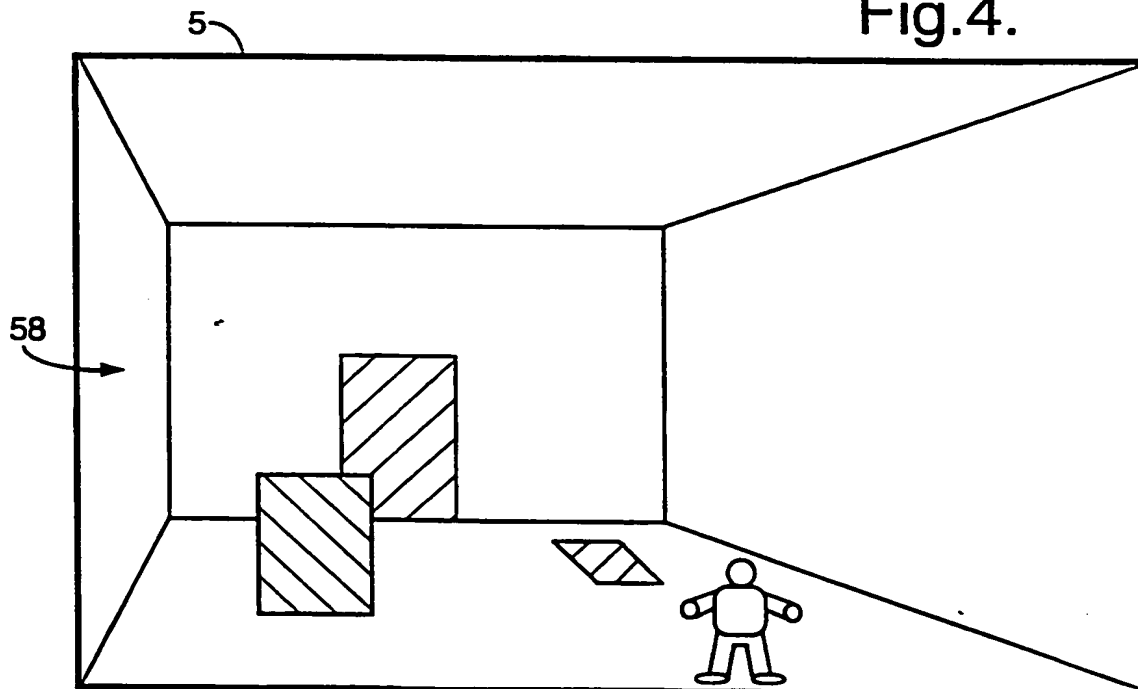
3/5

Fig.3.



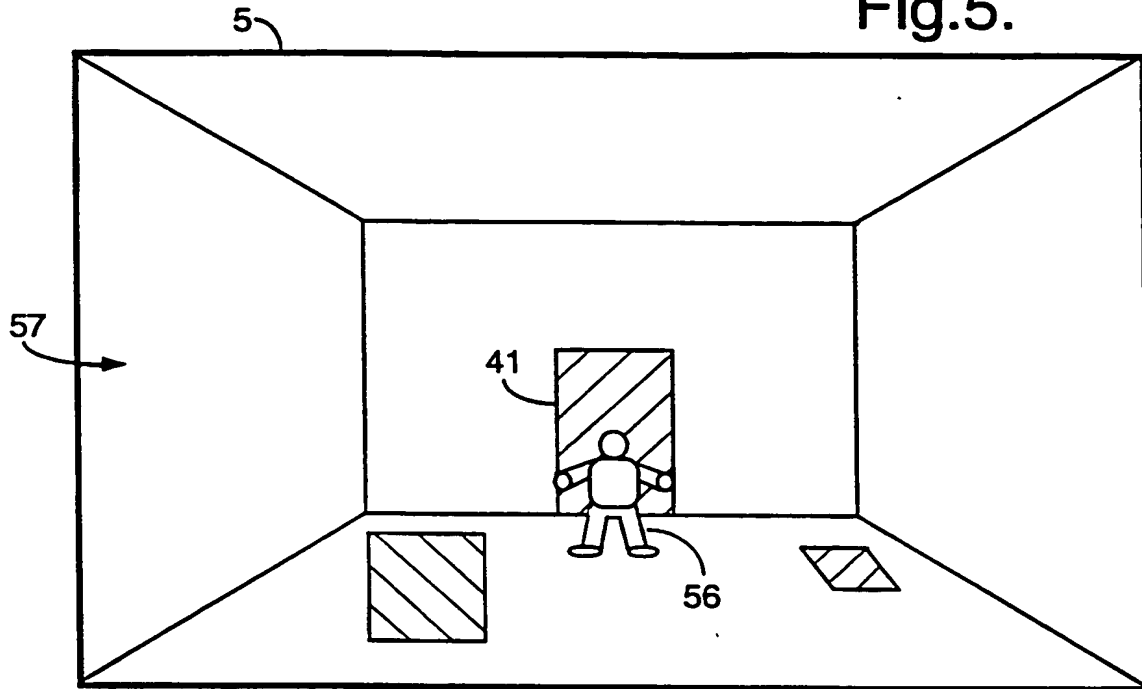
VIEW  
CHANGE

Fig.4.



4/5

Fig.5.



NEW  
ROOM

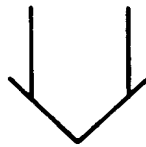
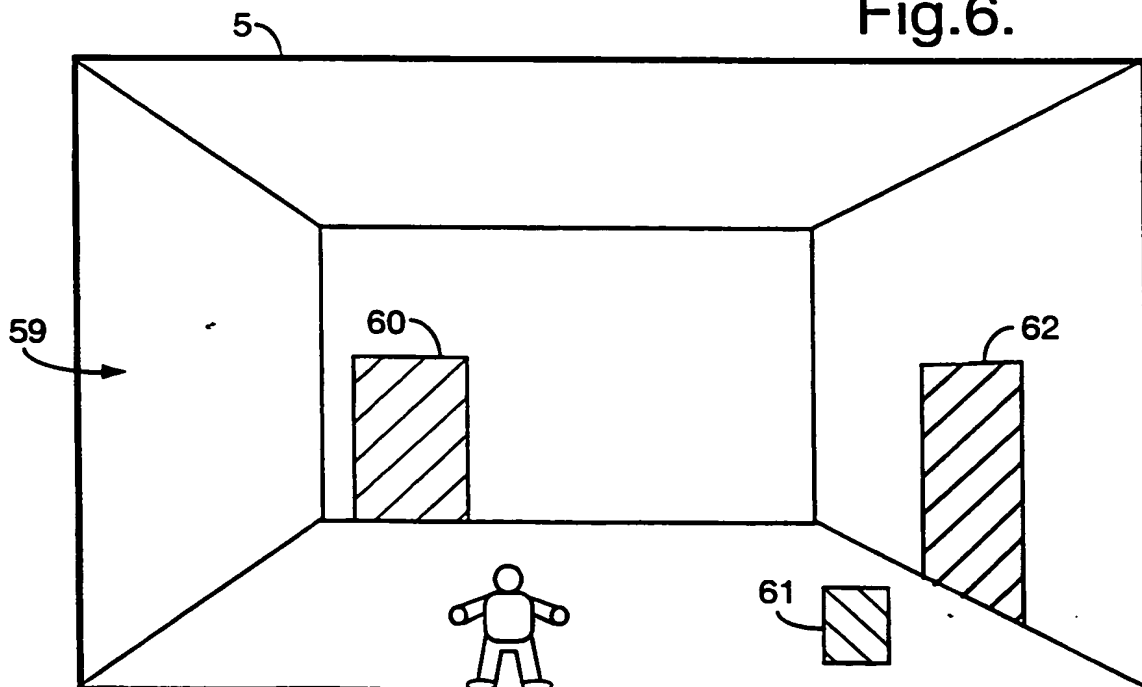


Fig.6.



5/5

Fig.7.

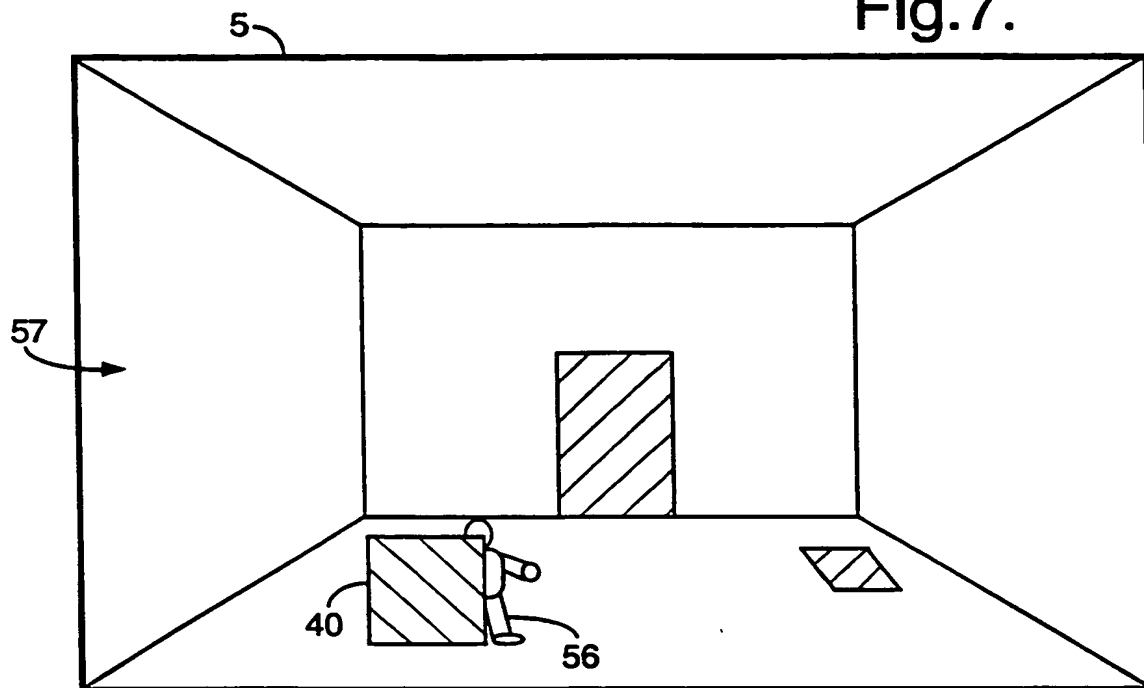
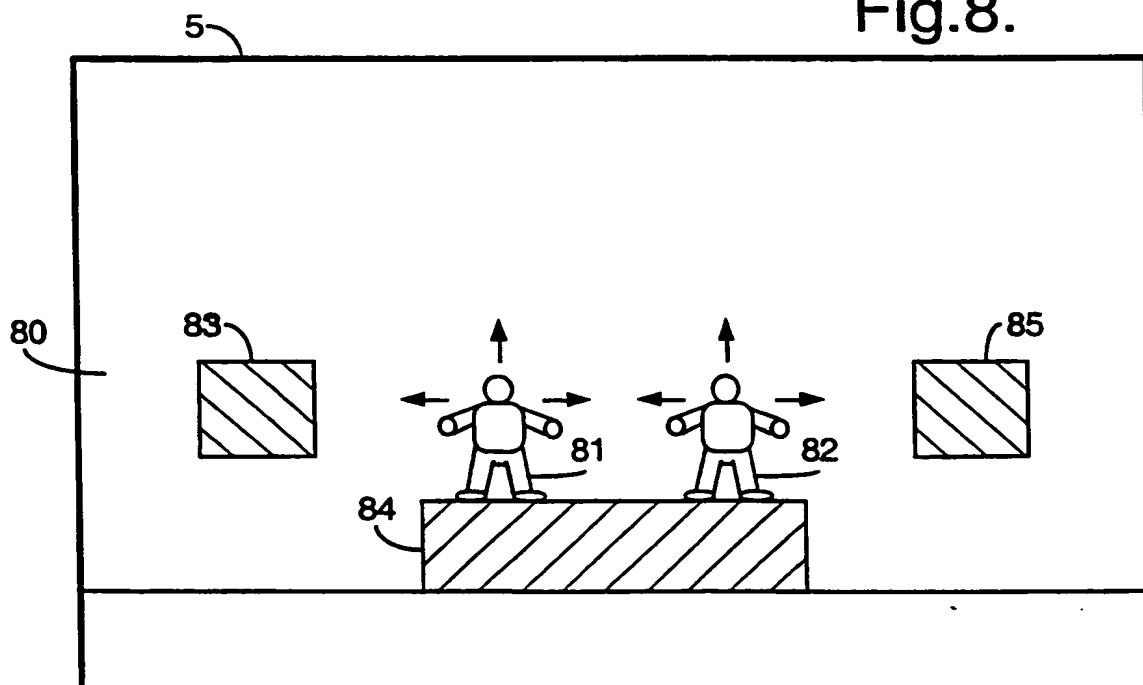


Fig.8.



# INTERNATIONAL SEARCH REPORT

1. National Application No

PCT/GB 98/01798

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 A63F9/22

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A63F G06F G09B G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

2 September 1998

Date of mailing of the international search report

10/09/1998

Name and mailing address of the ISA

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Authorized officer

Sindic, G

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

<b>To:</b>  GILL JENNINGS & EVERY Broadgate House 7 Eldon Street London EC2M 7LH GRANDE BRETAGNE	<div style="border: 2px solid black; padding: 5px; display: inline-block;"> <b>RECEIVED</b>                   30 SEP 1999                   GILL JENNINGS &amp; EVERY             </div>
--	--

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
(PCT Rule 71.1)

Date of mailing (day/month/year) <b>28.09.99</b>	
Applicant's or agent's file reference <b>RSJ05738WO</b>	<b>IMPORTANT NOTIFICATION</b>
International application No. <b>PCT/GB98/01798</b>	International filing date (day/month/year) <b>18/06/1998</b>
Priority date (day/month/year) <b>18/06/1997</b>	
Applicant <b>TWO WAY TV LTD et al.</b>	

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/  <div style="display: flex; align-items: center;"> <div>                         European Patent Office                          D-80298 Munich                          Tel. +49 89 2399 - 0 Tx: 523656 epmu d                          Fax: +49 89 2399 - 4465                     </div> </div>	Authorized officer  <b>Malmerdahl, A</b>  Tel. +49 89 2399-2928
--	---





# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>RSJ05738WO</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB98/01798</b>	International filing date (day/month/year) <b>18/06/1998</b>	Priority date (day/month/year) <b>18/06/1997</b>
International Patent Classification (IPC) or national classification and IPC <b>A63F9/22</b>		
Applicant <b>TWO WAY TV LTD et al.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  <b>12/01/1999</b>	Date of completion of this report  <b>2 8. 09. 99</b>
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office</b> <b>D-80298 Munich</b> <b>Tel. +49 89 2399 - 0 Tx: 523656 epmu d</b> <b>Fax: +49 89 2399 - 4465</b>	Authorized officer  <b>Mayer, S</b>  Telephone No. +49 89 2399 2934  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB98/01798

**I. Basis of the report**

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

**Description, pages:**

1,2,4-19	as originally filed			
3,3a	as received on	07/07/1999	with letter of	06/07/1999

**Claims, No.:**

1-12	as received on	07/07/1999	with letter of	06/07/1999
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**Drawings, sheets:**

1/5-5/5	as originally filed
---------	---------------------

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB98/01798

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-12
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-12
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/GB98/01798

Closest prior art is known from "KOENEN R ET AL: 'MPEG-4: Context and objectives' which describes a system which eases the integration of natural and synthetic audio and video material, as well as other type of data.

The problem to be solved by the present application is to enable the system to process also further signal types.

None of the cited documents describes the solution defined in claims 1 and 9 to combine a signal, representing a sequence of video frame signals together with objects defining data and control parameters.

This solution is also not obvious because KOENEN teaches to handle the video signals as objects and not in the form of video frame signals.

"MPEG-4: Context and Objections", Koenen et al, Signal Processing: Image Communication 9 (1997) pages 295-304 describes a system which eases the integration of natural and synthetic audio and video material, as well as other data types, such as text overlays and graphics. However, the paper admits that this cannot be used with frame-based video.

In accordance with a first aspect of the present invention there is provided apparatus for interactively generating a display signal, the apparatus comprising

a receiver for receiving a broadcast signal, the broadcast signal comprising at least one datastream including a sequence of video frames, data defining a background object corresponding to each video frame, and control parameters;

and a processing system for generating a foreground computer generated object (CGO), for monitoring the position of the foreground CGO with respect to the background object, and for combining the foreground CGO with the background object in accordance with the control parameters and with the video frame to generate the display signal.

In accordance with a second aspect of the present invention there is provided a method of interactively generating a display signal, the method comprising

receiving a broadcast signal, the broadcast signal comprising at least one datastream including a sequence of video frames, data defining a background object corresponding to each video frame, and control parameters;

generating a foreground computer generated object (CGO);

monitoring the position of the foreground CGO with respect to the background object; and,

combining the foreground CGO with the background object in accordance with the control parameters and with the video frame to generate the display signal.

3a

The present invention provides the capability of interaction with the actual broadcast itself as it appears on a screen in real time.

5 Typically the method and apparatus is provided for use in association with a TV set to provide levels of-----

CLAIMS

1. Apparatus for interactively generating a display signal, the apparatus comprising

5 a receiver for receiving a broadcast signal, the broadcast signal comprising at least one datastream including a sequence of video frames, data defining a background object corresponding to each video frame, and control parameters;

10 and a processing system for generating a foreground computer generated object (CGO), for monitoring the position of the foreground CGO with respect to the background object, and for combining the foreground CGO with the background object in accordance with the control  
15 parameters and with the video frame to generate the display signal.

2. Apparatus according to claim 1 wherein the control parameters define the position(s) of one or more areas of interaction in the background object, and wherein the  
20 processing system modifies the display signal when the position of the foreground CGO coincides with the position of a selected area of interaction.

3. Apparatus according to claim 2 wherein the control parameters define one or more rules associated with the or  
25 each area of interaction, and wherein the processing system modifies the display signal in accordance with the or each rule associated with the selected area of interaction.

4. Apparatus according to any of the preceding claims wherein the processing system modifies the display signal  
30 by modifying the foreground CGO.

5. Apparatus according to any of the preceding claims wherein the broadcast signal comprises a plurality of datastreams, the receiver being responsive to an upload request signal to select one of the datastreams, and  
35 wherein the apparatus further comprises means for inputting upload request signals to the receiver in response to input from a user.

6. Apparatus according to claim 5 wherein the processing system modifies the display signal by inputting an upload request signal to the receiver.

7. Apparatus according to any of the preceding claims  
5 further comprising a user operable controller for controlling the foreground CGO generated by the processing system.

8. Apparatus according to any of the preceding claims wherein the control parameters define the three-dimensional  
10 position of a feature in the background object, and wherein the processing system causes the foreground CGO to be at least partially obscured when the monitored position of the foreground CGO lies behind the three-dimensional position of the feature.

15 9. A method of interactively generating a display signal, the method comprising

receiving a broadcast signal, the broadcast signal comprising at least one datastream including a sequence of video frames, data defining a background object  
20 corresponding to each video frame, and control parameters; generating a foreground computer generated object (CGO);

monitoring the position of the foreground CGO with respect to the background object; and,

25 combining the foreground CGO with the background object in accordance with the control parameters and with the video frame to generate the display signal.

10. A method according to claim 9, wherein the broadcast signal comprises a plurality of datastreams, the method  
30 further comprising selecting one of the datastreams to be received.

11. A method according to claim 10, wherein each datastream includes a sequence of video frames each representing alternative views relating to a common  
35 subject.

12. A method according to claim 10 or claim 11, wherein the selecting step occurs when the foreground CGO is,



located at a predetermined position relative to the background object.

# PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired)(12 characters maximum) RSJ05738WO

Box No. I TITLE OF INVENTION  
METHOD AND APPARATUS FOR  
GENERATING A DISPLAY SIGNAL

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Two Way TV Ltd  
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414 Chiswick High Road  
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☐ This person is also inventor.

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Facsimile No.

Teleprinter No.

State (i.e. country) of nationality: United Kingdom

State (i.e. country) of residence: United Kingdom

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

HOLMES, Steven  
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Nottingham  
NG12 5AQ  
United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (if this check-box is marked, do not fill in below.)

State (i.e. country) of nationality: United Kingdom

State (i.e. country) of residence: United Kingdom

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

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Teleprinter No.

(051) 22765 GILPAT G

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

*If none of the following sub-boxes is used, this sheet is not to be included in the request.*

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

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United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(if this check-box is marked, do not fill in below.)*

State (i.e. country) of nationality:

United Kingdom

State (i.e. country) of residence:

United Kingdom

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

☐

the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

WRIGHT, David John  
Acacia House  
Old Wood  
Oaklands  
Old Welwyn  
Herts  
AL6 0QR

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(if this check-box is marked, do not fill in below.)*

State (i.e. country) of nationality:

United Kingdom

State (i.e. country) of residence:

United Kingdom

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

☐

the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

KYDD, Richard Andrew  
64 Popes Avenue  
Twickenham  
Middlesex  
TW2 5TT  
United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(if this check-box is marked, do not fill in below.)*

State (i.e. country) of nationality:

United Kingdom

State (i.e. country) of residence:

United Kingdom

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

☐

the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

This person is:

☐ applicant only

☐ applicant and inventor

☐ inventor only *(if this check-box is marked, do not fill in below.)*

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☐

the United States of America only

☐

the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

## Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

## Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment is desired, specify on dotted line) .....

## National Patent (if other kind of protection or treatment is desired, specify on dotted line):

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AL Albania .....                               | <input checked="" type="checkbox"/> LT Lithuania .....                                 |
| <input checked="" type="checkbox"/> AM Armenia .....                               | <input checked="" type="checkbox"/> LU Luxembourg .....                                |
| <input checked="" type="checkbox"/> AT Austria .....                               | <input checked="" type="checkbox"/> LV Latvia .....                                    |
| <input checked="" type="checkbox"/> AU Australia .....                             | <input checked="" type="checkbox"/> MD Republic of Moldova .....                       |
| <input checked="" type="checkbox"/> AZ Azerbaijan .....                            | <input checked="" type="checkbox"/> MG Madagascar .....                                |
| <input checked="" type="checkbox"/> BA Bosnia & Herzegovina .....                  | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia ..... |
| <input checked="" type="checkbox"/> BB Barbados .....                              | <input checked="" type="checkbox"/> MN Mongolia .....                                  |
| <input checked="" type="checkbox"/> BG Bulgaria .....                              | <input checked="" type="checkbox"/> MW Malawi .....                                    |
| <input checked="" type="checkbox"/> BR Brazil .....                                | <input checked="" type="checkbox"/> MX Mexico .....                                    |
| <input checked="" type="checkbox"/> BY Belarus .....                               | <input checked="" type="checkbox"/> NO Norway .....                                    |
| <input checked="" type="checkbox"/> CA Canada .....                                | <input checked="" type="checkbox"/> NZ New Zealand .....                               |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein .....  | <input checked="" type="checkbox"/> PL Poland .....                                    |
| <input checked="" type="checkbox"/> CN China .....                                 | <input checked="" type="checkbox"/> PT Portugal .....                                  |
| <input checked="" type="checkbox"/> CU Cuba .....                                  | <input checked="" type="checkbox"/> RO Romania .....                                   |
| <input checked="" type="checkbox"/> CZ Czech Republic .....                        | <input checked="" type="checkbox"/> RU Russian Federation .....                        |
| <input checked="" type="checkbox"/> DE Germany .....                               | <input checked="" type="checkbox"/> SD Sudan .....                                     |
| <input checked="" type="checkbox"/> DK Denmark .....                               | <input checked="" type="checkbox"/> SE Sweden .....                                    |
| <input checked="" type="checkbox"/> EE Estonia .....                               | <input checked="" type="checkbox"/> SG Singapore .....                                 |
| <input checked="" type="checkbox"/> ES Spain .....                                 | <input checked="" type="checkbox"/> SI Slovenia .....                                  |
| <input checked="" type="checkbox"/> FI Finland .....                               | <input checked="" type="checkbox"/> SK Slovakia .....                                  |
| <input checked="" type="checkbox"/> GB United Kingdom .....                        | <input checked="" type="checkbox"/> SL Sierre Leone .....                              |
| <input checked="" type="checkbox"/> GE Georgia .....                               | <input checked="" type="checkbox"/> TJ Tajikistan .....                                |
| <input checked="" type="checkbox"/> GH Ghana .....                                 | <input checked="" type="checkbox"/> TM Turkmenistan .....                              |
| <input checked="" type="checkbox"/> GM Gambia .....                                | <input checked="" type="checkbox"/> TR Turkey .....                                    |
| <input checked="" type="checkbox"/> GW Guinea-Bissau .....                         | <input checked="" type="checkbox"/> TT Trinidad and Tobago .....                       |
| <input checked="" type="checkbox"/> HU Hungary .....                               | <input checked="" type="checkbox"/> UA Ukraine .....                                   |
| <input checked="" type="checkbox"/> ID Indonesia .....                             | <input checked="" type="checkbox"/> UG Uganda .....                                    |
| <input checked="" type="checkbox"/> IL Israel .....                                | <input checked="" type="checkbox"/> US United States of America .....                  |
| <input checked="" type="checkbox"/> IS Iceland .....                               | <input checked="" type="checkbox"/> UZ Uzbekistan .....                                |
| <input checked="" type="checkbox"/> JP Japan .....                                 | <input checked="" type="checkbox"/> VN Viet Nam .....                                  |
| <input checked="" type="checkbox"/> KE Kenya .....                                 | <input checked="" type="checkbox"/> YU Yugoslavia .....                                |
| <input checked="" type="checkbox"/> KG Kyrgyzstan .....                            | <input checked="" type="checkbox"/> ZW Zimbabwe .....                                  |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea ..... |  |
| <input checked="" type="checkbox"/> KR Republic of Korea .....                     |  |
| <input checked="" type="checkbox"/> KZ Kazakstan .....                             |  |
| <input checked="" type="checkbox"/> LC Saint Lucia .....                           |  |
| <input checked="" type="checkbox"/> LK Sri Lanka .....                             |  |
| <input checked="" type="checkbox"/> LR Liberia .....                               |  |
| <input checked="" type="checkbox"/> LS Lesotho .....                               |  |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐ .....
- ☐ .....
- ☐ .....

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of .....

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

## Box No. VI PRIORITY CLAIM

Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier applications is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1)  GB	18 June 1997 18.06.1997	9712724.5	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s) : 1

## Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA/

Earlier Search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:

Country (or regional Office): \_\_\_\_\_ Date (day/month/year): \_\_\_\_\_ Number: \_\_\_\_\_

## Box No. VIII CHECK LIST

This international application contains the following number of sheets:

- |                |   |           |               |
|----------------|---|-----------|---------------|
| 1. request     | : | 4         | sheets        |
| 2. description | : | 19        | sheets        |
| 3. claims      | : | 2         | sheets        |
| 4. abstract    | : | 1         | sheets        |
| 5. drawings    | : | 5         | sheets        |
| <b>Total</b>   | : | <b>31</b> | <b>sheets</b> |

This international application is accompanied by the item(s) marked below:

- |   |  |
|---|--|
| 1. <input type="checkbox"/> separate signed power of attorney                         | 5. <input type="checkbox"/> fee calculation sheet                                    |
| 2. <input type="checkbox"/> copy of general power of attorney                         | 6. <input type="checkbox"/> separate indications concerning deposited microorganisms |
| 3. <input type="checkbox"/> statement explaining lack of signature                    | 7. <input type="checkbox"/> nucleotide and/or amino acid sequence listing (diskette) |
| 4. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): | 8. <input type="checkbox"/> other (specify):   |

Figure No. 1 of the drawings (if any) should accompany the abstract when it is published.

## Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

For the Applicant  
Gill Jennings & Every

SKONE JAMES, Robert Edmund

Date: 18 June 1998

For receiving Office use only

1. Date of actual receipt of the purported international application:	2. Drawings:  <input type="checkbox"/> received:  <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority specified by the applicant: <u>ISA/</u>	
6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

# PATENT COOPERATION TREATY

PCT

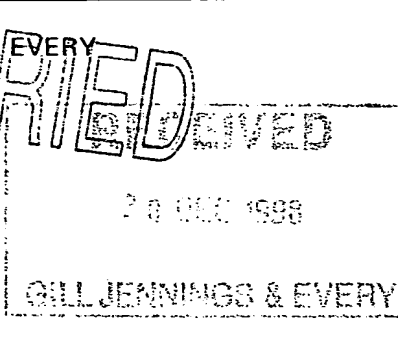
## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

GILL JENNINGS & EVERY  
Broadgate House  
7 Eldon Street  
London EC2M 7EH  
ROYAUME-UNI



Date of mailing (day/month/year) 23 December 1998 (23.12.98)		IMPORTANT NOTICE	
Applicant's or agent's file reference RSJ05738WO			
International application No. PCT/GB98/01798	International filing date (day/month/year) 18 June 1998 (18.06.98)	Priority date (day/month/year) 18 June 1997 (18.06.97)	
Applicant TWO WAY TV LTD. et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU, BR, CA, CN, EP, IL, JP, KP, KR, PL, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AL, AM, AP, AT, AZ, BA, BB, BG, BY, CH, CU, CZ, DE, DK, EA, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, OA, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 23 December 1998 (23.12.98) under No. WO 98/57718

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

## PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)

To:

Gill Jenings & Every  
Broadgate House  
7 Eldon Street  
London, EC2M 7LH  
UNITED KINGDOM

Date of mailing  
(day/month/year)

10/09/1998

Applicant's or agent's file reference

RSJ05738W0

**FOR FURTHER ACTION**

See paragraphs 1 and 4 below

International application No.

PCT/GB 98/01798

International filing date

(day/month/year)

18/06/1998

Applicant

TWO WAY TV LTD et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland  
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicants's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority

European Patent Office, P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Patricia Klingens-Herklots

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

## INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

### What parts of the International application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

### What documents must/may accompany the amendments?

**Letter (Section 205(b)):**

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.



## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### "Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>RSJ05738W0</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 98/ 01798</b>	International filing date (day/month/year) <b>18/06/1998</b>	(Earliest) Priority Date (day/month/year) <b>18/06/1997</b>
Applicant <b>TWO WAY TV LTD et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

- ☐ filed with the international application.
- ☐ furnished by the applicant separately from the international application,
- ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the title, ☒ the text is approved as submitted by the applicant  
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract, ☒ the text is approved as submitted by the applicant  
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:  
Figure No. 2 ☐ as suggested by the applicant. ☐ None of the figures.  
☐ because the applicant failed to suggest a figure.  
☒ because this figure better characterizes the invention.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 98/01798

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A63F9/22

According to International Patent Classification(IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A63F G06F G09B G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	-/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier document but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.  
"&" document member of the same patent family

Date of the actual completion of the international search

2 September 1998

Date of mailing of the international search report

10/09/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Sindic, G

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 98/01798

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DOENGES P K ET AL: "Audio/video and synthetic graphics/audio for mixed media" SIGNAL PROCESSING. IMAGE COMMUNICATION, vol. 9, no. 4, May 1997, page 433-463 XP004075338	1,4,9,10
Y A	see page 434, left-hand column, paragraph 1 see page 434, right-hand column, paragraph 1 see page 435, left-hand column, paragraph 2 see page 437, left-hand column, paragraph 1 see page 438, left-hand column, paragraph 2 see page 439, right-hand column, paragraph 3 - page 441, right-hand column, paragraph 1 see page 442, left-hand column, paragraph 3	8 2,3,5-7
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